

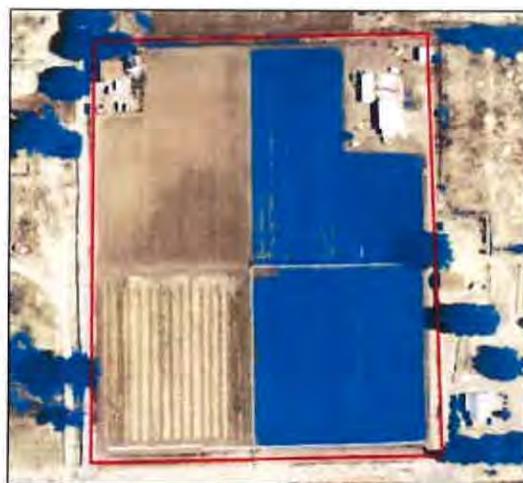
**EVALUATION OF IRRIGATED ACREAGE 2014-2018 UNDER FRUITLAND,  
HOGBACK, AND CUDEI IRRIGATION CANALS,  
SAN JUAN COUNTY, NEW MEXICO**

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF NEW MEXICO

IN RE: GOLD KING MINE RELEASE  
IN SAN JUAN COUNTY, COLORADO,  
ON AUGUST 5, 2015

*This Document Relates to All Cases*

MDL 1:18-MD-2824-WJ



**Expert Report of:  
Michael Dane Goble**

**Prepared for:**  
Montgomery & Andrews Law Firm and Weston Solutions, Inc.

Glaser Weil Fink Howard Avchen and Shapiro, LLP and Environmental Restoration, LLC

United States Department of Justice

**July 7, 2021**

**Michael Dane Goble**



**GLORIETA GEOSCIENCE, INC.**  
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**Exhibit 1**

**EXHIBIT  
M. Goble  
1264**

## INTRODUCTION

Glorieta Geoscience, Inc. (GGI) was retained by Montgomery & Andrews, P.A. on behalf of defendant Weston Solutions, Inc. (Weston); Glaser, Weil, Fink, Howard, Avchen & Shapiro, LLC, on behalf of defendant Environmental Restoration, LLC, (ER); and the U.S. Department of Justice on behalf of defendant the United States, all defendants in U.S. District Court Case: *In re: Gold King Mine Release in San Juan County, Colorado on August 5, 2015*; Case No. 1:18-MD-22824-WJ (D. N.M.) as related to all cases. GGI was formally retained by the defendants in May and June of 2021 after the unfortunate and untimely death of the previous defendant expert. The litigation includes claims by individual farmers (the “Individual Plaintiffs”) for alleged crop damage losses caused by the August 5, 2015 Gold King Mine (GKM) spill/release.

Due to recent engagement in this case and COVID-related restrictions on the Navajo Nation, GGI was unable to conduct a field visit to the subject farms prior to submitting this report. A field visit will be scheduled in the future.

For this analysis, GGI obtained publicly-available and private satellite imagery from 2014, 2015, 2016, and 2018 to evaluate vegetative cover on Individual Plaintiffs’ Land Use Permit Plots (LUPP). Efforts were made to obtain imagery for the 2017 growing season, but none was available. Vegetated acres were estimated for each year using Normalized Difference Vegetation Index (NDVI), an index that can be used to indicate the presence of growing vegetation. Total vegetated acreage from each LUPP was compared to cultivated acres claimed as lost by Individual Plaintiffs in their Federal Tort Claims Act (FTCA) Administrative Claims, the Plaintiff Questionnaires prepared by plaintiffs’ counsel, and claims made in depositions of plaintiffs that provided LUPP documentation.

Results from the NDVI analysis provide an assessment of the presence or absence of actively growing vegetation on LUPPs identified by plaintiffs as experiencing damage from the GKM spill by accounting for the number of vegetated acres within each LUPP boundary. Results from the NDVI analysis do not identify different types of vegetation or determine the health of vegetation, other than to discriminate between actively growing vegetation and barren or fallow land. This approach ensures that most, if not all, actively growing vegetation is accounted for in each LUPP during the peak growing season.

## UNCERTAINTIES

Uncertainties in GGI’s investigation include:

1. Acreage and location of specific crops within each LUPP
2. Age of individual alfalfa stands (some deponents testify to age of alfalfa in depositions)
3. Documented records of historic crop production and cash receipts from cultivated acreage within each LUPP
4. Location of fruit bearing trees within each LUPP

Therefore, 2015 NDVI threshold values were adjusted to 0.08, instead of 0.2 used for NAIP imagery.

After threshold values were established, each LUPP, as received from BIA, was analyzed on a pixel-by-pixel basis. Pixels above the threshold value for each Plot were summed and converted to acres. The resulting value of acres above the established NDVI threshold is presented as the total acres of actively growing vegetation within each LUPP on the day the image was captured.

Results from this analysis are presented in Appendix B.

## ANALYSIS OF SUCCESSFUL CROPS GROWN BY ALLEN PLAINTIFFS IN 2016

Of the 115 Allen Plaintiffs with identified LUPPs, 16 plaintiffs were identified that grew crops in 2016. Based on the natural color imagery, a visual inspection of this sub-group indicated that each of the 16 plaintiffs grew a crop on at least a portion of their LUPP in 2016 that was of similar acreage as their 2014 crop. NDVI results were not relied on for this specific analysis.

Similar acreage of cultivated crops on these plots in 2016, when compared to 2014, indicates that any agricultural losses, with respect to a claimed reduction in productive acreage in 2016 or later, are related to changes in farming practices (e.g., refusing San Juan River irrigation water) rather than the release of material from the GKM. The 16 plaintiffs are identified below and maps of their individual LUPPs are presented in Appendix B.

- Bessie Tesswood
- James Simpson
- Cecil Duncan
- Jerome Smith
- Roger Barber
- Darrell Jim
- Jimmie Coolidge
- Roger Sherman
- Duane Aspaas
- Lucinda Benally
- Ron Miller
- Harry S. Nakai
- Marlene Dobey
- Susan Benally
- Hubert Harwood
- Melvin Curley

## ANALYSIS OF LOST ACRES CLAIMED VERSUS VEGETATED ACRES FOR ALLEN PLAINTIFFS

GGI compared total lost acres claimed in FTCA Administrative Claim Forms and Plaintiff Questionnaires by Allen Plaintiffs against total vegetated acres identified within all LUPPs through NDVI analysis, and the results are presented in Table 1 below. Of the 115 plaintiffs that provided LUPPs, 49 plaintiffs listed total claimed acres lost in 2015. Values in Table 1 below were calculated by summing total claimed lost acres and summing total acres classified as vegetated within LUPPS for the 49 plaintiffs. Vegetated acres were derived from NDVI analysis results for 2014, 2015, 2016, and 2018.

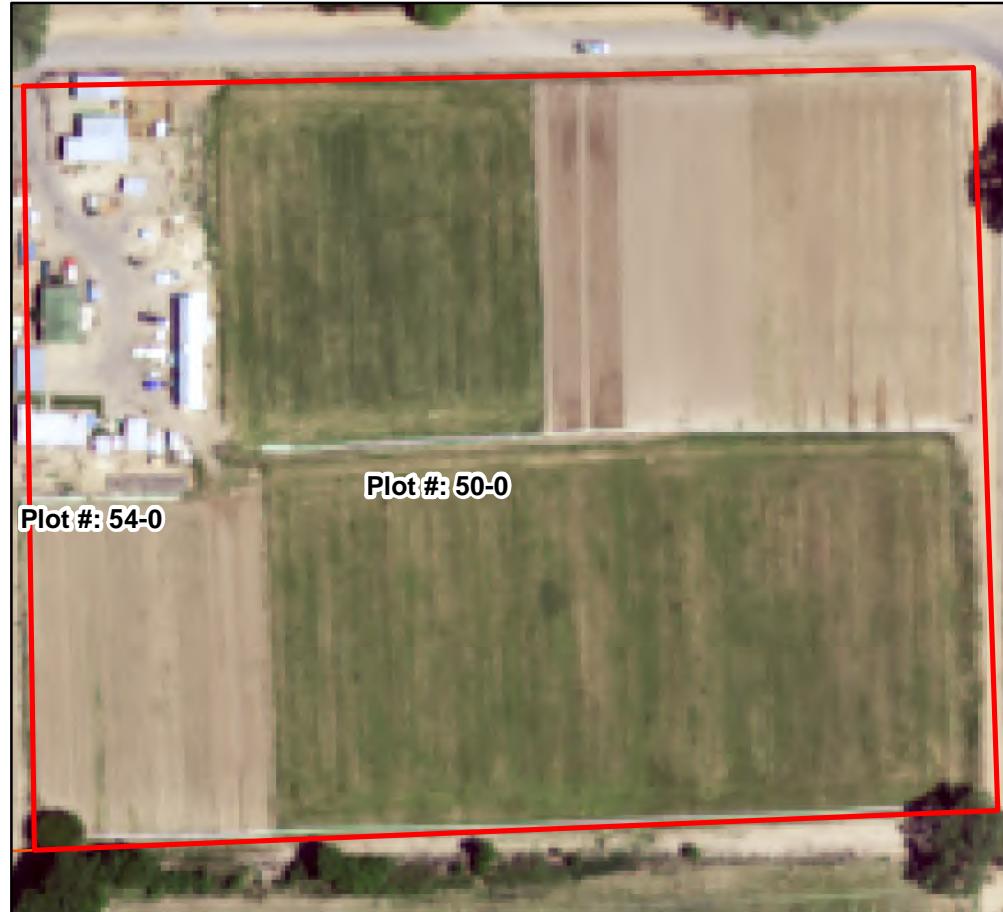
**Table 1. Claimed Lost Acres Versus NDVI Vegetated Acres**

<b>Total Lost Acres Claimed (n=49)</b>	<b>2014 Total NDVI Acres</b>	<b>2015 Total NDVI Acres</b>	<b>2016 Total NDVI Acres</b>	<b>2018 Total NDVI Acres</b>
634	265	298	171	158

Estimated lost acreage in 2015, based on claims made by 49 plaintiffs, was 634 acres (Table 1). This represents more than double (213%) the acreage identified by the NDVI analysis as actively growing vegetation in July, 2015, prior to the GKM spill on August 5, 2015.

## CONCLUSIONS

1. Conclusions Related to the Entire Analyzed Set of Plaintiffs
  - a. No reproducible records of historic crop production on plaintiffs' LUPPs have been provided.
  - b. Significant discrepancies exist between claims listed on the FTCA Administrative Claim Forms, Plaintiff Questionnaires, and testimony provided in depositions.
  - c. NDVI analysis of individual LUPPs indicates that relatively few plaintiffs had as many vegetated acres present in July 2015 as stated in their claims.
  - d. Of the four years of imagery that were reviewed, no single year showed that total vegetated acres were equal to total lost acres claimed for all 49 plaintiffs in 2015. In all years analyzed, vegetated acres were less than half of total lost acres claimed.
  - e. Based on visual inspection of the natural color imagery, 16 plaintiffs were identified as having cultivated a crop on at least a portion of their LUPP in 2016 that was as healthy as their crop in 2014.
2. Conclusions Specific to Individual Plaintiffs
  - a. For each plaintiff analyzed, the total acreage of actively growing vegetation within the LUPP is listed in the first rows of the tables presented in Appendix B.
  - b. The dates analyzed for each year are within the growing season for the analyzed region, so there is no cultivated crop in a given year on any portion of the LUPPs that did not meet the applicable threshold in the NDVI analysis.
  - c. Because the analysis does not discriminate between cultivated crops and trees, shrubs, or other natural vegetation, the NDVI analysis tends to overestimate the acreage under cultivation for any given LUPP. The vegetated acres presented in the NDVI analysis in Appendix B represents the maximum acreage that may contain an actively growing crop.



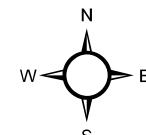
Name	Bessie Tesswood
NDVI Analysis Results	2014: 4.7 ac. veg. cover (56.0%); 2015: 4.4 ac. veg. cover (52.7%); 2016: 2.8 ac. veg. cover (33.3%); 2018: 4.1 ac. veg. cover (49.5%)
Project	Fruitland
Plot No.	50
Land Use Permit Acres	8 ac
Forms	Allen Plaintiffs 2137; Allen 5533
FTCA Lost Alfalfa	3 cuts, \$1,800
FTCA Lost Alfalfa Acres	4 ac
Written Lost Alfalfa Acres	Unclear if alfalfa planted in 2015
Total Claim	\$159,579.76
Total Acres Lost	N/A
FTCA Crop Damage	7.75 acres; lost all in 2015; did not plant in 2016
Written Crop Damage	3.75 acres
FTCA Irrigation	Started irrigating again from April-September 2016
Written Irrigation	Stopped irrigating for 1.5 years; but started using San Juan again May 2016
Discrepancies	2137 claims 7.75 acres of crops; 5533 claims 3.75 acres

  Land Use Permit Boundary

## NDVI Analysis Results

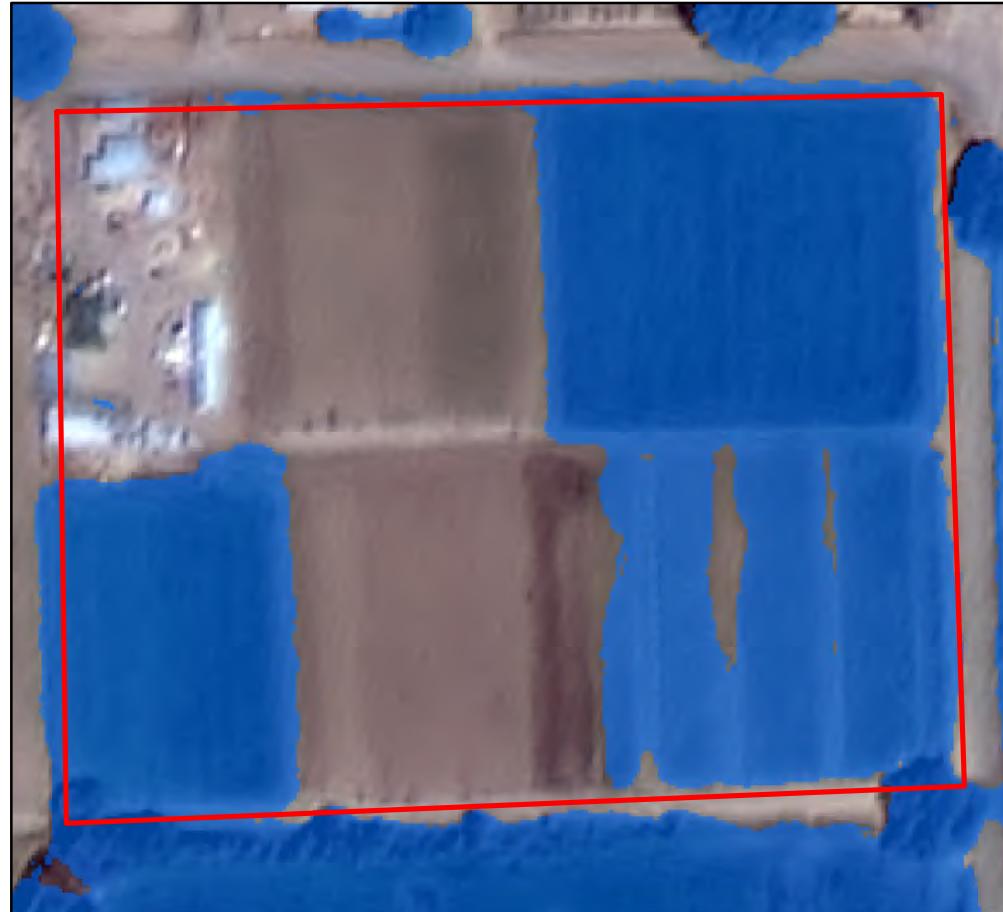
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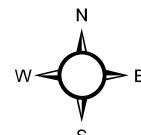
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Land Use Permit Boundary

## NDVI Analysis Results

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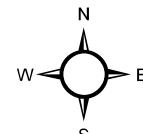
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  Land Use Permit Boundary

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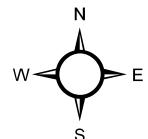
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  Land Use Permit Boundary

## NDVI Anlaysis Results

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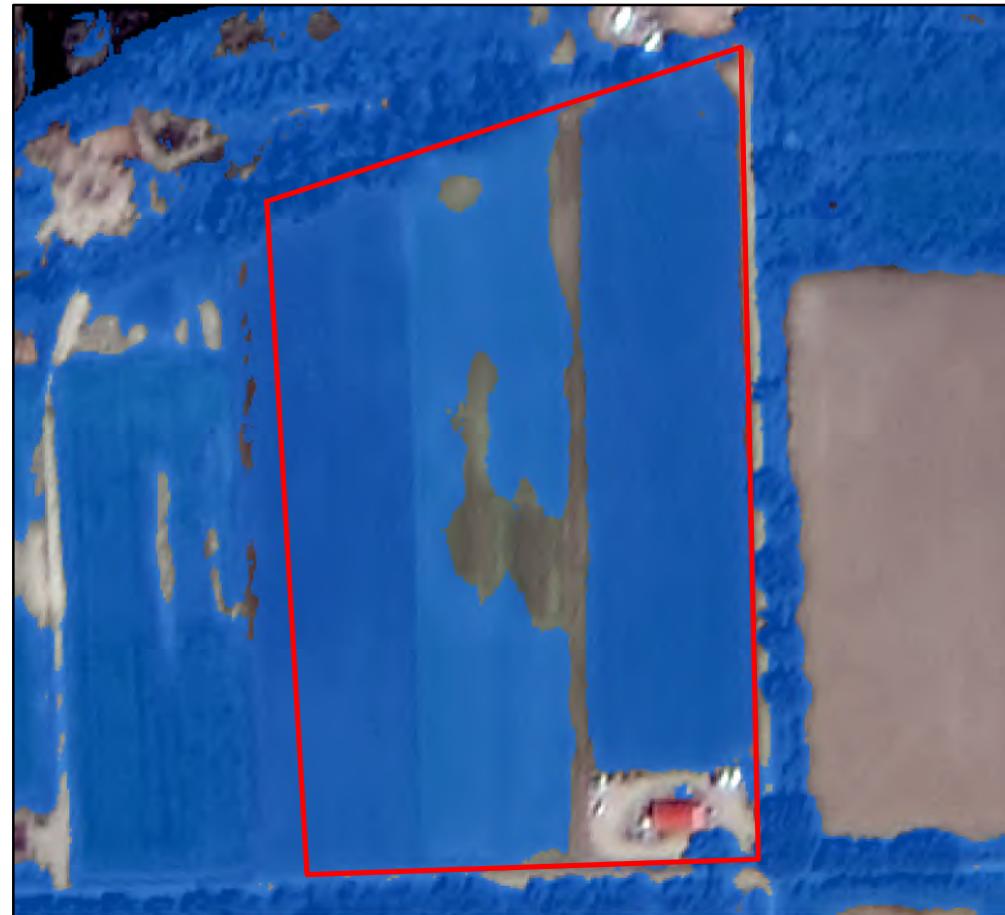


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July 6, 2015

Natural Color with NDVI Analysis Overlay



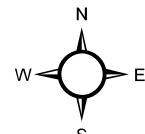
Name	Roger Barber
NDVI Analysis Results	2014: 8.5 ac. veg. cover (94.1%); 2015: 7.8 ac. veg. cover (85.9%); 2016: 5.0 ac. veg. cover (55.5%); 2018: 3.3 ac. veg. cover (36.0%)
Project	Fruitland
Plot No.	13-0
Land Use Permit Acres	9.5 ac
Forms	Allen Plaintiffs 61; Allen 2626
FTCA Lost Alfalfa	0 in 2015, \$5,610 in 2016
FTCA Lost Alfalfa Acres	9 ac
Written Lost Alfalfa Acres	3 ac
Total Claim	\$63,926.06
Total Acres Lost	9.5 ac
FTCA Crop Damage	9.5 acres; alfalfa okay; less yield in 2017 and weed overgrowth
Written Crop Damage	9.5 acres
FTCA Irrigation	Stopped irrigating for a short time and continued through 2015 and 2016
Written Irrigation	Continued irrigating through 2015 and 2016, but crop not producing as much
Discrepancies	61 claims 9 acres of alfalfa; 2626 claims 3 acres of alfalfa

Land Use Permit Boundary

## NDVI Analysis Results

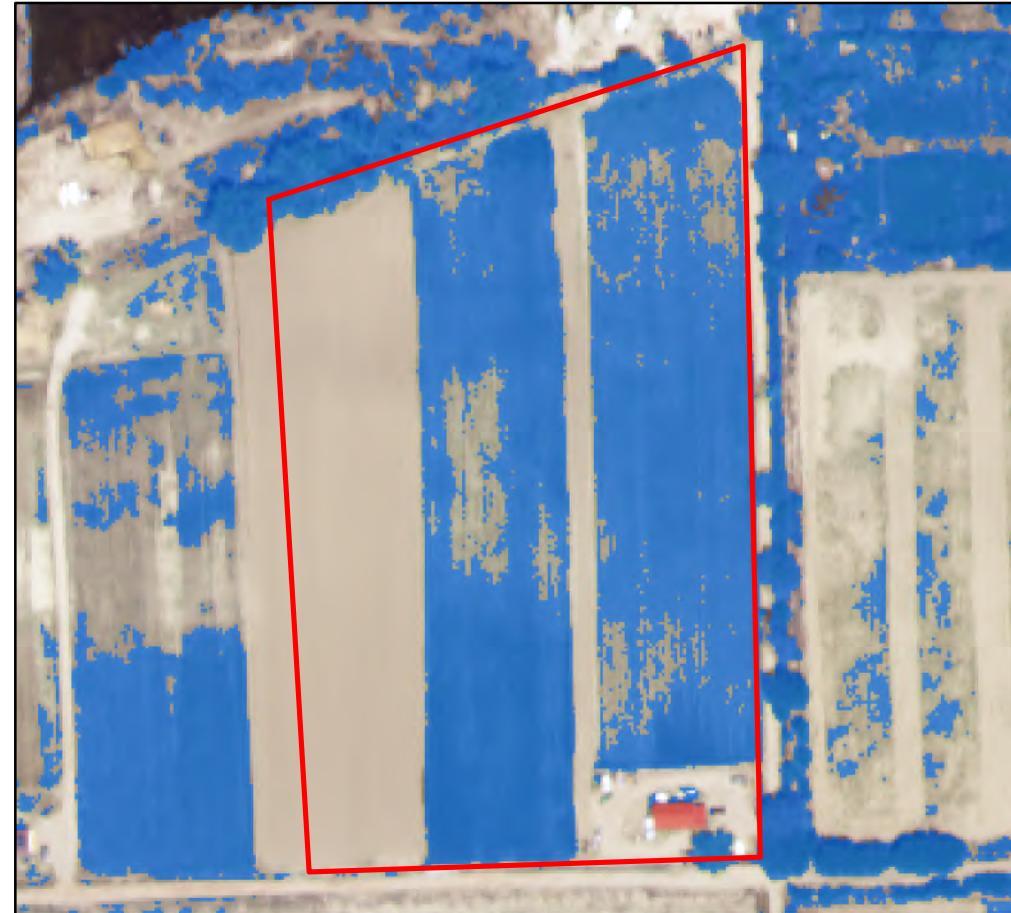
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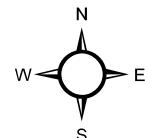
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Land Use Permit Boundary

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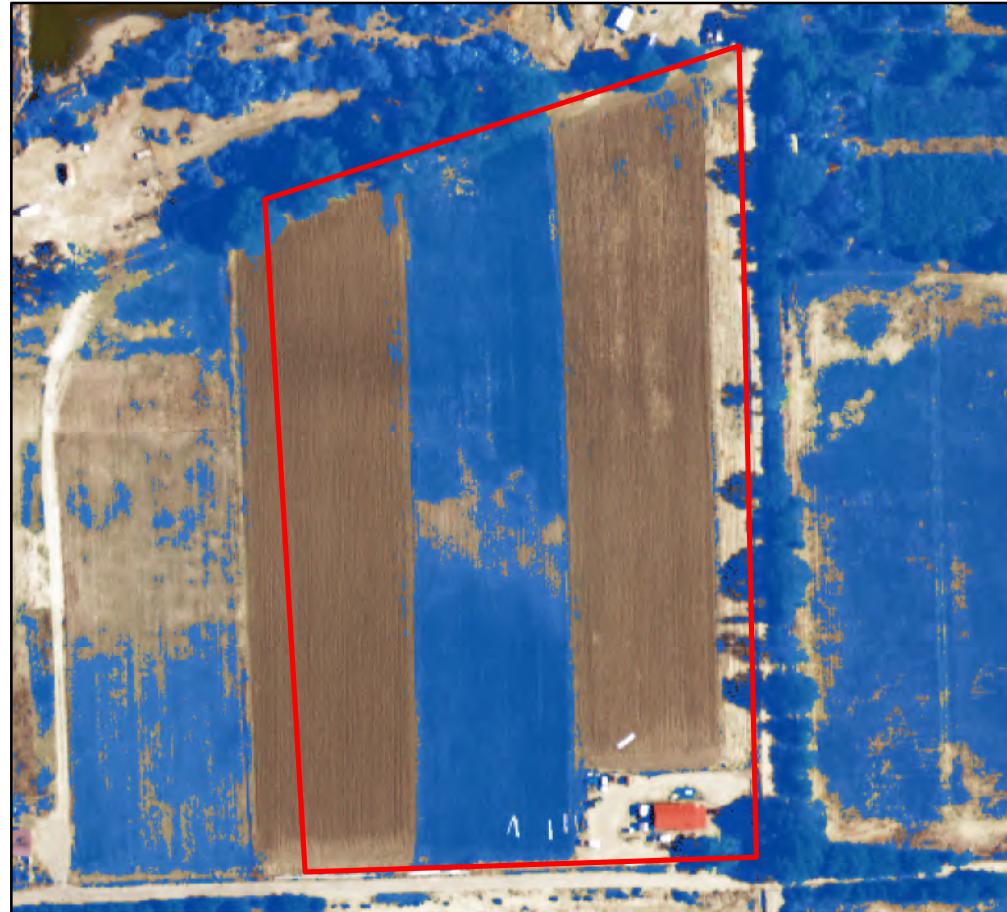
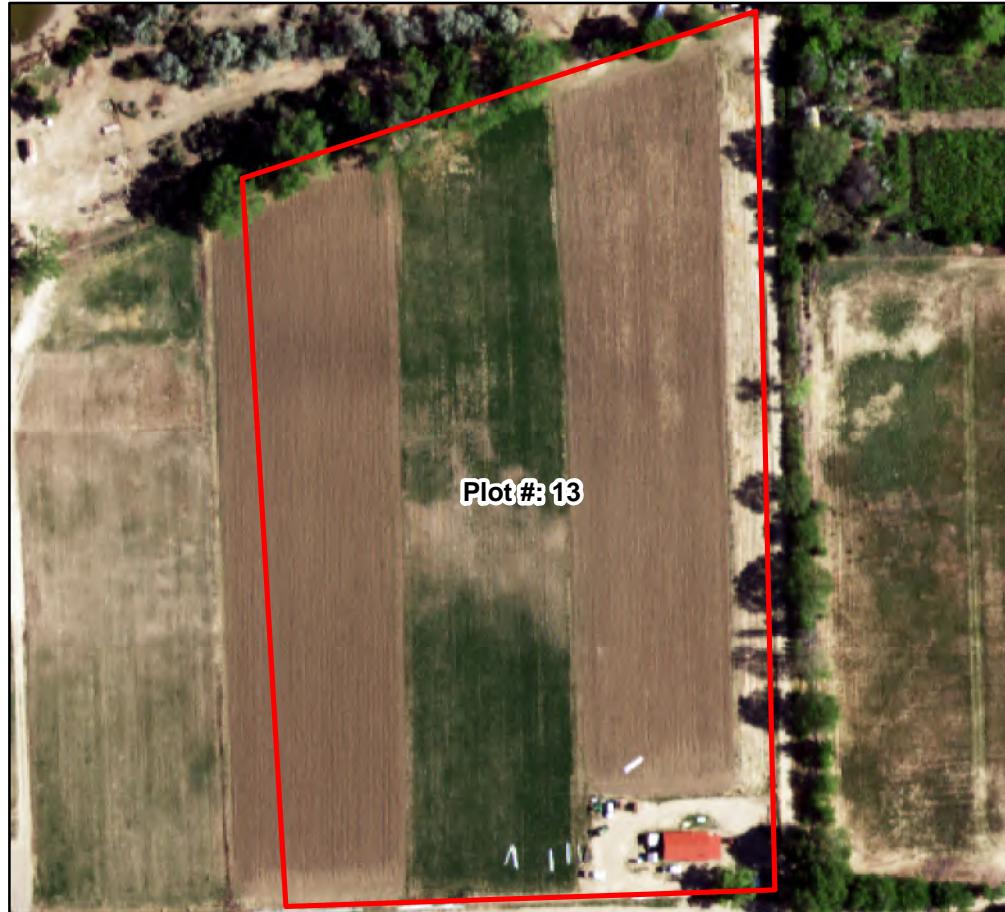
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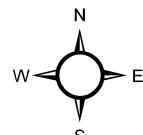
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Land Use Permit Boundary

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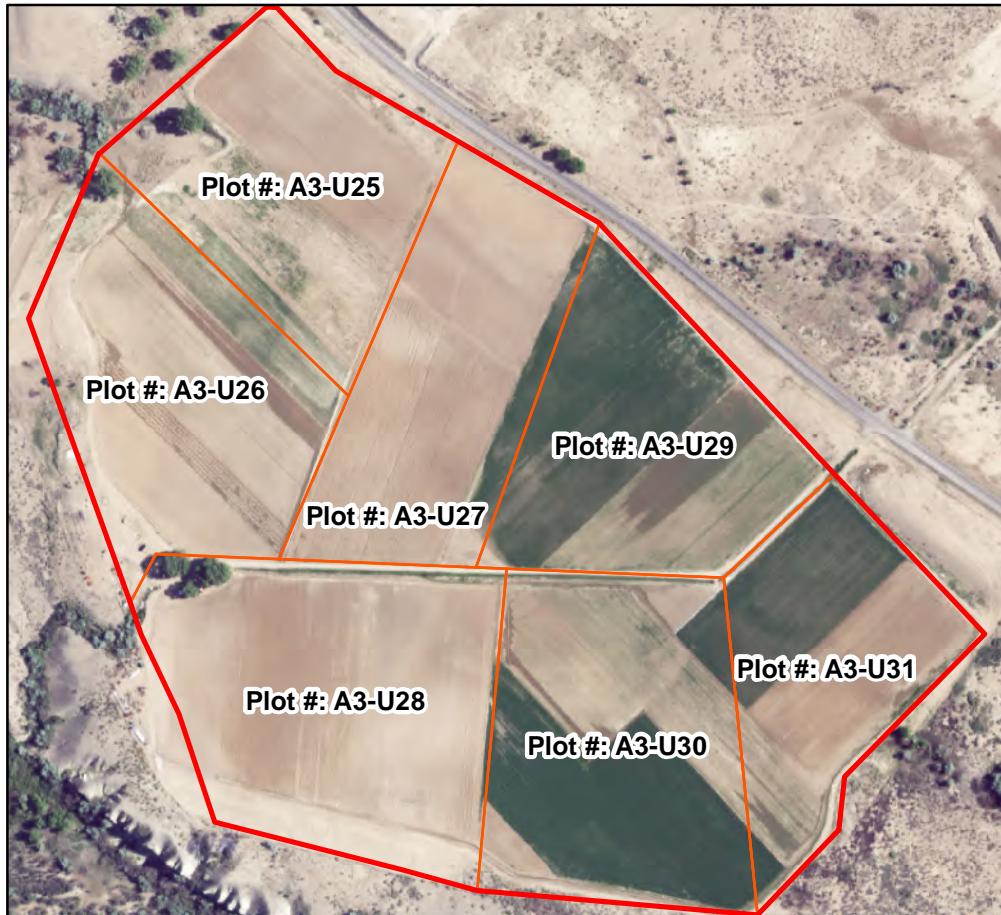
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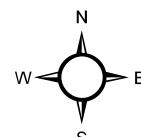
Name	Thomas Tyler
NDVI Analysis Results	2014: 25.3 ac. veg. cover (28.2%); 2015: 19.4 ac. veg. cover (21.7%); 2016: 6.3 ac. veg. cover (7.1%); 2018: 2.0 ac. veg. cover (2.2%)
Project	Hogback
Plot No.	Area 3, Units 25-31
Land Use Permit Acres	96.2 ac
Forms	Allen Plaintiffs 2243; Allen 5733
FTCA Lost Alfalfa	2 cuts, \$11,700, replacement hay \$2,370
FTCA Lost Alfalfa Acres	"A significant proportion of land"
Written Lost Alfalfa Acres	48.5 ac
Total Claim	\$3,013,721.20
Total Acres Lost	96.2 ac
FTCA Crop Damage	96.2 acres lost in 2015 and 2016
Written Crop Damage	96.2 acres; no sales in 2016 or 2017
FTCA Irrigation	Hauled water for 30 days
Written Irrigation	Stopped irrigating for 2.5 years
Discrepancies	N/A

Land Use Permit Boundary

## NDVI Analysis Results

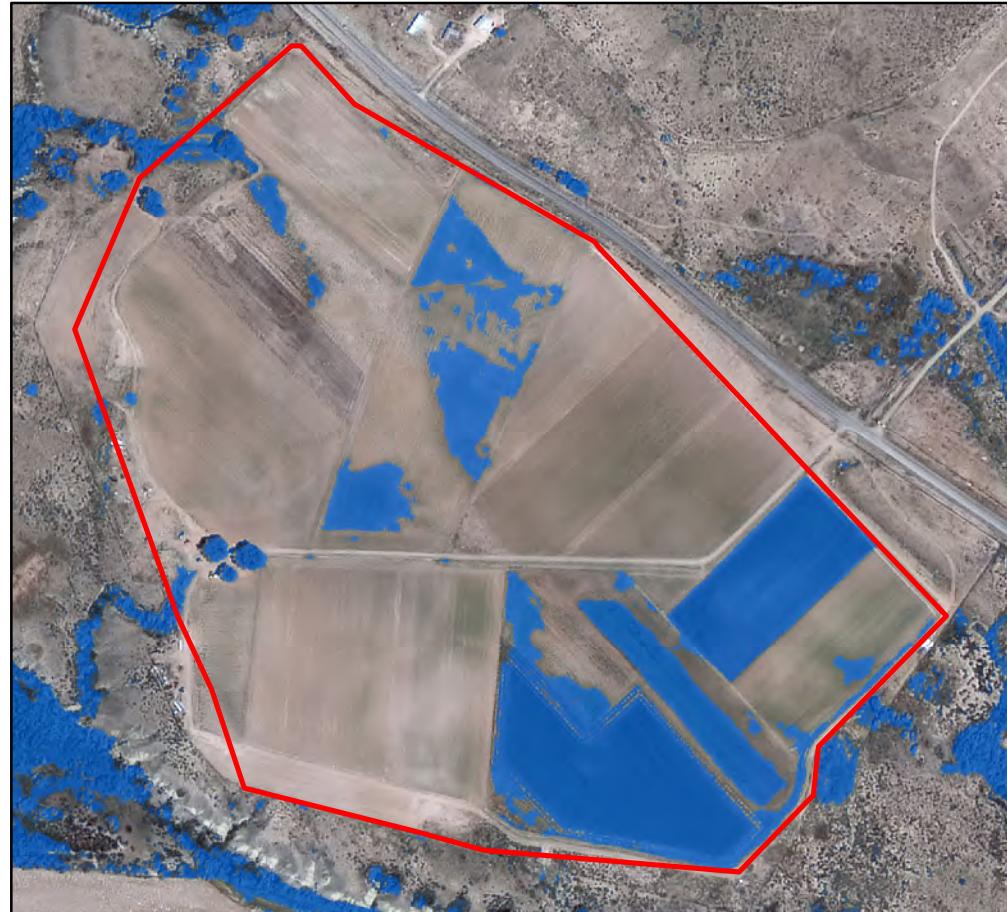
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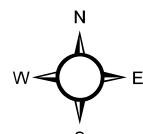
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Land Use Permit Boundary

## NDVI Analysis Results

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0.08 - 1.0



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